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the extreme dryness of the atmosphere, the want of shelter from the intense rays of the sun — an intensity one can hardly appreciate until he has passed a few summer days far out on the Plains — and the dry, heated powerful winds so constant here, few would be surprised at the faded, bleached and worn plumage that characterizes the birds of the Plains. It is more noticeable of course in those that do not frequent the timber, though more or less apparent in all. Here the common “house” wren is bleached and faded, forming the so-called *Troglodytes Parkmanni*, differing from the *T. ædon* of the east only in this particular. The meadow and horned larks look singularly “weather worn,” the former constituting the *Sturnella neglecta* of authors, and the latter the *Alauda rufa* of Audubon, in which the yellow almost entirely disappears from the forehead, throat and lores, fading to white. The night-hawk becomes much lighter and paler, forming the race known as *Chordeiles Henryi*; *Peucea æstivalis* wears a very faded aspect, and forms the so called *P. Cassinii*. The yellow-winged sparrow becomes equally faded and changed, and the killdeer plover shows a similar paling of the colors, which is also noticeable in birds as brightly colored as the Baltimore oriole. The color of the mountain plover is in similar harmony with the mid-summer gray tint of the plains. In respect to the Baltimore, we find here a well marked race, characterized by the middle coverts of the wing being *white* instead of bright yellow, and by having much more white on edges of the secondaries. The bill is also slenderer and relatively longer. The Leavenworth specimens I find are, in respect to color, about half way between the Fort Hays type and the common form of the Eastern States.

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## DIRECTIONS FOR COLLECTING MICROLEPIDOPTERA.

BY LORD WALSLINGHAM.

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HAVING been asked to give a few directions for collecting Microlepidoptera, I think I can best do so by describing as shortly as possible my own mode of proceeding, adding such hints as may occur to me.

I go out with a coat provided with large pockets inside and out, containing an assortment of pill boxes generally of three sizes, glass bottomed pill boxes preferred, a bag slung over my shoulder, and a net. Unless searching for particular day flying species I prefer the last three hours before dark. As the sun goes down many species move which do not stir at other times. I watch the tops of the grass, the stems of the flowers, the twigs of the trees; I disturb leaves and low growing plants with a short switch and secure each little moth that moves, taking each out of the net in a separate pill box, selected according to the size of the insect, as he runs up the net to escape. Transferring the full boxes to the bag I continue the process until moths cease flying or night sets in. Many species can be taken with a lamp after dark.

Returning to camp I put a few drops of liquid ammonia on a small piece of sponge and place it in a tin canister with such of the boxes as do not contain the smallest species, and put these and the remainder away until morning in a cool place. In the morning I prepare for work by getting out a pair of scissors, a pair of forceps, my drying box containing setting boards, a sheet of white paper and some pins.

First, I cut two or three narrow pieces of paper from three to six lines wide, or rather wider, according to the size of the largest and smallest specimens I have to set. I then double each of these strips and cut it up into braces by a number of oblique cuts. Now I turn out the contents of the canister and damp the sponge with a few drops of fresh ammonia, refilling with boxes containing live insects. Those which have been taken out will be found to be all dead and in a beautifully relaxed condition for setting. Had the smallest specimens been placed in the canister over night, there would have been some fear of their drying up, owing to the small amount of moisture in their bodies.

If the weather is very hot there is some danger of killed insects becoming stiff while others are being set, in which case it is better at once to pin into a damp cork box all that have been taken out of the canister, but under ordinary circumstances I prefer to pin them one by one as I set them.

Taking the lid off a box, and taking the box between the finger and thumb of the right hand, I roll out the insect on the top of the left thumb, supporting it with the top of the fore finger and so manipulating it as to bring the head pointing towards my right

hand and the thorax uppermost. Now I take a pin in the right hand and resting the first joint of the middle finger of the right against the projecting point of the middle finger of the left hand to avoid unsteadiness, I pin the insect obliquely through the thickest part of the thorax so that the head of the pin leans very slightly forward over the head of the insect. After pressing the pin far enough through to bring about one-fourth of an inch out below, I pin the insect into the middle of the groove of a setting board so that the edge of the groove will just support the undersides of the wings close up to the body when they are raised upon it. The board should be chosen of such a size as will permit of the extension of the wings nearly to its outer edge. The position of the pin should still be slanting a little forward. The wings should now be raised into the position in which they are intended to rest, with especial care in doing so not to remove any scales from the surface or cilia of the wings. Each wing should be fastened with a brace long enough to extend across both, the braces being pinned at the thick end, so that the head of the pin slopes away from the point of the brace; this causes the braces to press more firmly down on the wing when fixed. The insect should be braced thus: the two braces next the body should have the points upwards, the two outer ones pointing downwards and slightly inwards towards the body, and covering the main portion of the wings beyond the middle. Antennæ should be carefully laid back above the wings, and braces should lie flat, exercising an even pressure at all points of their surface. The fore wings should slope slightly forwards so that a line drawn from the point of one to the point of the other will just miss the head and palpi. The hind wings should be close up, leaving no intervening space but just showing the upper angle of the wing evenly on each side. I can give no more precise directions as to how this desirable result may most simply and speedily be attained; no two people set alike. Speed is an object; for I have often had to set twelve dozen insects before breakfast. A simple process is essential, for a man who is always pinning and moving pins, and rearranging wings and legs, is sure to remove a certain number of scales and spoil the appearance of the insect besides utterly destroying its value. I raise each of the fore wings with a pin and fix the pin against the inner margin so as to keep them in position while I apply the braces. Half the battle is really in the pinning. When an insect is

pinned through the exact centre of the thorax, with the pin properly sloped forward; the body appears to fall naturally into its position on the setting board, and the muscles of the wings being left free are easily directed and secured; but if the pin is not put exactly in the middle, it interferes with the play of the wings. Legs must be placed close against the body or they will project and interfere with the set of the wings. Practice, care and a steady hand will succeed. When all the insects that have been killed are set, the contents of the canister will be found again ready, twenty minutes being amply sufficient to expose to the fumes of ammonia. Very bright green, or pale pink insects should be killed by some other process, say chloroform, as ammonia will affect their colors.

Insects should be left on the setting boards a full week to dry, then the braces may be carefully removed and they may be transferred to the store box.

Having given some account of the process each insect goes through I will say a word as to the apparatus required.

First as to nets. The simplest net is a strong, circular, iron wire hoop with bag of book muslin attached, fastened into a light deal or other handle.

I use a small pocket net about 9 inches in diameter made to fold up, with a jointed wire frame and a screw to fit into a brass socket in a short cane handle. To counteract the strain of the net upon so slight a frame the three wire joints are made flat, the two side joints flattened across the strain, the upper one the reverse way; but to prevent this upper joint from coming into play when the net is fixed, the upper part of the screw which holds the frame to the handle is welded square and fits a corresponding square socket in the other end of the wire frame, holding all tight when screwed down. A small green silk or other net can be slipped on or off this frame as required.

An umbrella net with stout steel rim and canvas edging is useful for sweeping tall grass and herbage, or to beat branches into, by which means many small and beautiful species of retired habits may be obtained.

I use pill boxes with glass bottoms, which can be obtained of various sizes. They are convenient in admitting of the examination of each specimen, so rare species can be especially searched for, and damaged ones permitted to escape; but they are expensive and for

ordinary purposes cardboard boxes answer sufficiently well. It is a good plan at the beginning of a season to strengthen all your boxes by a crossed strap of tape or calico firmly glued at the top and bottom. For a killing box any tin box or canister with a closely fitting lid capable of containing one hundred pill boxes will be found to answer.

Setting boards can be bought ready made of the smallest sizes. They are made by gluing a strip of thick cork on a thin slip of deal, the cork must be thick enough to enable a groove to be cut into it, deep enough to hold the bodies of the insects to be set and to leave sufficient depth for the pin to hold firmly without reaching the deal. The cork on each side of the groove should be smoothed off with a gentle curve, so that the wings dry in a good position. The deal backing projects beyond the cork so as to slide into a groove if required, and it is convenient to have a deal cupboard of drying boxes with handle at top and perforated zinc door, having grooves on each side into which the setting boards can be slid. Each board should be papered with thin white paper.

At the beginning of a season setting boards may be washed or brushed over with advantage with a weak solution of oxide of zinc, it fills up old pinholes and makes them look clean.

For *Tortricina* use No. 10 pins; for *Tineina* (small), No. 19; for *Nepticulæ*, No. 20.

Always set your insects as soon as you kill them, they are then much more easy to set and retain their position better when dry.

When pill boxes are filled keep them cool to prevent the insects from fluttering; if glass boxes, keep them also in the dark.

Many species when first taken will flutter in the boxes and injure themselves; for these it is well when collecting to carry a small phial of chloroform and a zinc collecting box corklined, into which you can at once pin your captures; the cork should be damped to keep them fresh. Touching a pill box with a finger moistened with chloroform will kill the insect inside. Too much chloroform is apt to stiffen the nerves of the wings and interfere with setting.

By breeding Microlepidoptera many species not otherwise easily obtainable may be added to a collection, and the habits of others in the larva state may be studied with much interest. For this purpose a few wide mouthed glass bottles should be obtained with corks to fit, so that the small larvæ can be placed in them with fresh food and the food kept fresh by exclusion of air. If

mould should appear the cork can be replaced by muslin or net tied over. I would hardly advise a travelling collector to attempt this method although I have adopted it with some success, but in a stationary camp it is most interesting and comparatively easy.

Corklined store boxes are of course required into which to remove the insects when sufficiently dried on the setting boards. These, as well as the pins and setting boards with drying case to hold them, and the net frames of the folding and umbrella patterns will best be obtained from some dealer in such things.\*

To pack *Microlepidoptera* for travelling, pin them firmly close together into a corklined box, so that each specimen just gently holds down the body of the one above it. This cannot be done with very minute species. Put your box into another larger box and let the outer one be sufficiently large to leave a good clear six inches all round the inner one. Pack this intervening space with hay not crammed too tight; it will act as a spring and reduce the effect of shaking; the whole parcel should be made thoroughly secure against damp.

In conclusion I would say that I shall be happy to receive specimens from collectors in all parts of the world and will willingly send European species in exchange where this is desired; or if preferred I will pay at the rate of, say four cents each, for all specimens sent in good condition. I shall also be happy to answer all communications upon the subject and to send a small box containing two or three specimens as types to show how insects ought to be set, to any one who proposes to send me specimens. Moreover should any collector send me insects in good condition I will willingly supply him with a full outfit of setting boards and pins and a store box to encourage further collections.†

Insects in a damaged condition are not of the slightest value to me in any way.

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\*In London there are several, among whom I would mention T. Cook, New Oxford Street, and Thomas Eedle, Maidstone Place, Hackney Row. The manufacturers of entomological pins, which can, however, be obtained from the above dealers, are Messrs. Eddleston & Williams, Birmingham; Messrs. Kirby & Beard, Canon Street, London. In America, The Naturalists' Agency, Salem, Mass., and C. G. Brewster & Co., Washington St., Boston, keep on hand insect pins, cork, pill boxes, and most of the other articles required by the collector.

† Address, The Lord Walsingham, Merton Hall, Thetford, England.